Thank you once again for your responses. Please place your completed survey in the large envelope marked "SURVEYS" in the office, or simply return it to the researcher.

Teacher Perceptions and Attitudes
About Teaching Statistics in P-12 Education

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The teaching of statistics at the elementary and secondary level is a relatively new expansion of the curriculum. Considering the many challenges faced by teachers of statistics in higher education, there is a continuing need to evaluate and monitor teaching and learning at this level. The purpose of this study was to survey elementary and secondary teachers to determine their attitudes about statistics, their perceptions related to student attitudes and achievement, and their attitudes about their preparation and training. The findings based on the results of a survey suggest that although most of the teachers have overall positive attitudes about their statistics experiences, many were undecided about their experiences, and most reported that they need additional preparation and training. Implications are discussed from the results and suggestions are offered to statistics educators in an effort to improve and advance the teaching and learning of statistics in P-12 education.

Introduction

The reform movement in statistics education helped to shape the emergence of statistics as a separate discipline (Bessant & MacPherson, 2002; Higgins, 1999; Moore, 1998) and has revolutionized the teaching and learning of statistics in all levels of education. The Undergraduate Statistics Education Initiative (USEI) of the American Statistical Association (ASA) is one of the many projects designed to advance this movement. Its mission is to expand and improve undergraduate statistical education by organizing symposia and workshops, creating guidelines for programs, marketing statistics education products and programs, and supporting the continuing development and delivery of the modern statistics curriculum (Amstat News, 1999). Many other ASA-sponsored affiliates such as the Center for Statistics Education, the Section of Statistical Education, and the ASA -MAA (Mathematical Association of America) Joint Committee on Undergraduate Statistics also have similar objectives. As a result of the many reform efforts, "statistical literacy" has become an important objective in many undergraduate and graduate level classrooms as well as across various disciplines.

The teaching and learning of statistics has increased dramatically in the elementary and secondary schools over the past few years. The Quantitative Literacy Project of the American Statistical Association,

which began in the 1980s, provides instructional materials related to statistics and probability for the pre-college curriculum. In addition, the release of a standards-based curriculum (National Council of Teachers of Mathematics (NCTM), 1989; 1991; 2OOO), designed to improve mathematics education from pre-kindergarten to grade 12 (P-12), includes content standards that emphasize probability and statistical reasoning (i.e., Data Analysis and Probability). As a result, more students are studying statistics, particularly in secondary education.

One indication is that the number of students taking the Advanced Placement (AP) statistics examination has more than quadrupled from 1997 to 2000 (Peck, 2001).

Teacher Preparation

In response to the recent demands placed on P-12 teachers to teach statistics, there continues to be much discussion and research about how to best train and prepare teachers for the classroom. Administrators, statistics educators, and other organizations are also involved with advancing the development of the teaching of statistics in the P-12 curriculum. The AP statistics program, in association with the College Board, offers programs such as Pre-AP while Beyond AP Stats (BAPS) and the Adopt-a-School Program are ASA-affiliated programs -- all provide support for the teaching and learning of statistics for teachers and students in P-12 education. In addition, pre- and in-service workshops are also offered by many school districts and local universities for the ongoing and continuing education needs of elementary and secondary teachers.

Furthermore, research indicates that professional development activities are probably the most important resource for mathematics teachers, if not the most important (Ball, 1991; Battista, 1999; Hill & Ball, 2004). For 398 K-8 mathematics teachers participating in California's Mathematics Professional Development Institutes, Hill and Ball (2004) concluded that the number of actual days of a workshop along with a specific focus related to the workshop (i.e., mathematical analysis, reasoning, and communication) predicted their teachers' learning. In addition, based on their findings, they also concluded that teachers can learn mathematics for elementary school teaching in the context of a *single* professional development program. Schoen, Cebulla, Finn, and Fi (2003) found similar results in that the completion of a professional development workshop course that focused specifically on preparing to teach a course 'effectively' (i.e., workshop activities that were tied specifically to the issues that the teachers would face when they taught the course to their students in the upcoming year) was positively related to growth in student achievement for 40 grade 9-12 teachers, including 1466 students in 26 schools. Furthermore, they also reported that a year of teaching a pilot version of the same course did not appear to be an adequate substitute.

Another important factor to be considered for preparing teachers to teach is their attitude or belief toward the subject. There is considerable evidence to indicate that teacher attitudes about mathematics influence their learning and teaching of mathematics (Hart, 2002; Quinn, 1997; Richardson, 1996; Thompson, 1992). As a result, many teacher education programs, aligned with the philosophy of current mathematics education reform efforts, are beginning to also focus on improving teacher attitudes and beliefs in mathematics methods courses to address such preconceived

ideas (Nespor, 1987). Findings suggest that preparing future teachers with positive beliefs about themselves as teachers and learners of mathematics is equally important (Ball, 1990; Battista, 1986; Hart, 2002; Wilkins & Brand, 2004).

Teacher Implications

Considering that statistics is emerging and taught as a separate discipline primarily in higher education and increasingly now in secondary education, many questions come to mind about the teaching and learning of statistics in primary and secondary education. Statistics instruction at the postsecondary level is challenging, even for mathematics teachers. Not only can statistics be a difficult subject for students to understand, it can sometimes be quite challenging to teach. To this end, there is an abundance of research in the statistics education literature suggesting how, when, and what teachers should teach (i.e., Chance & Rossman, 2001; Garfield, 1995; Halvorsen, 1999; Lock, 2000; Moore, 1997; Peck, 1999; Velleman & Moore, 1996) to improve statistics learning. Furthermore, teachers not only have to be concerned about content and pedagogy but also student attitudes about statistics, which have been shown to be related to performance (Gal, Ginsburg, & Schau, 1997).

There also appears to be a plentiful source of research regarding elementary and secondary teachers' mathematics teaching experiences yet not much is known about the teachers at this level teaching statistics. One finding indicates that similar to teachers in higher education, many mathematics and statistics teachers in elementary or secondary education feel uncomfortable teaching statistics concepts because they have not been adequately trained (Franklin, 2000; Gal, 1992). Furthermore, previous research suggests that many of these teachers have either never taken a formal statistics course or have had very little formal training (Begg & Edwards, 1999; Franklin, 2000). Only a few other studies have considered elementary and secondary teachers' experiences with statistics teaching and learning, with less than optimistic results. Onwuegbuzie (1998) compared teacher attitudes toward statistics with graduate students enrolled in a psychology course as well as graduate and undergraduate students enrolled in a variety of disciplines (Elmore & Lewis, 1991; Elmore, Lewis, & Bay, 1993; Shultz & Koshino, 1998). The results revealed that teachers had less positive attitudes toward the field of statistics and the course than graduate students in psychology. They also had less positive attitudes toward the field of statistics than undergraduate students. Other important findings revealed that teachers who had never taken a statistics course reported less positive attitudes toward statistics than teachers who had taken at least one course. Negative attitudes about

statistics were also reported by elementary and pre-service teachers in a study conducted by Begg and Edwards (1999). Teachers in their study reported that they felt reasonably confident about teaching statistics at their class level, although their attitudes about statistics were negative and their understanding of concepts was limited and weakly developed (Begg & Edwards, 1999).

Purposes

Teachers who teach statistics in higher education have faced difficulties with the teaching of the subject and student learning for many decades. Now, with current reform movements in statistics and mathematics education, the teaching and learning of statistics is an important part of the curriculum in elementary and secondary education. There is an abundance of empirical research related to statistics education issues in higher education; however, there appears to be a need for more research about the teaching and learning of statistics in P-12 education. Although there are many areas to consider for research, teacher and student attitudes about teaching and learning statistics, as well as teacher preparation, are issues that are important and studied at length in higher education. Therefore, the purpose of this study was to survey elementary and secondary teachers to determine their attitudes about statistics, their perceptions related to student attitudes and achievement, and their attitudes about their preparation and training. Another purpose of this paper was to use the results to assess teacher and student needs in an effort to improve statistics education in our schools as well as to contribute to the limited research regarding the experiences of elementary and secondary teachers teaching statistics.

Method

Participants and Procedure

Administrators and directors from 10 counties across the state worked with researchers from The University of Alabama (and a graduate student) to assist in data collection for this study. The sample included teachers who taught mathematics and statistics at 5 elementary schools, 9 high schools, and 20 middle schools across the state of Alabama. The directors first met with each chairperson from their respective mathematics departments during a regularly schedule meeting during the course of the school year. The chair people were asked to survey all of the mathematics and statistics teachers in their department within a few days. Almost all of the teachers responded to a Likert-scaled survey, with a few teachers not responding due to absences or other unknown reasons. A few months later, a mandatory in-service workshop sponsored by The University of Alabama In-Service Center and a local school district was held for many

of the same teachers who responded to the first survey. A follow-up survey was given at the end of that workshop to a random sample of teachers (who responded to the first survey) randomly selected by the director of the local school district. Using open-ended questions, the teachers wrote their responses to more in-depth questions about their experiences teaching statistics. The nature of this workshop was not directly related to the teaching of statistics or statistics concepts and was held a few days before the opening of school in the fall semester. During each administration, the teachers were assured of confidentiality and the study was approved through the Institutional Review Board by The University of Alabama. The researcher of this study was not at any of the sites or was not directly involved with any of the data collection.

One-hundred and eighty-six (n=186) teachers responded to the first survey about their statistics experiences. Most of the teachers (77.8%) were female, almost 8 percent of the teachers taught pre-kindergarten or kindergarten (7.5%), 16% taught grades 1-5, and most of the sample included teachers who taught grades 6-8 (37.4%) and grades 9-12 (38.5%). Approximately 46% of the respondents had more than 12 years of teaching experience, 18% had 3-5 years, 14% had 9-12 years, about 11% had 0-2 years, and 10% had 6-8 years. Most of the teachers (39%) reported that they have taken one college-level statistics course, 28.3% indicated that they have had two courses, and about 20% reported having no course. Almost half of the teachers (47.5%) reported having a master's degree and 43.87% reported only a bachelor's degree.

Reliability and Validity

Two statistics teachers worked together to design the items for the survey. One teacher was considered an expert in the measurement, content, and teaching field, as well as with the population for whom the survey was intended. Both teachers reviewed the items for wording, grammar, ambiguity, level of readability, and any other technical flaws, as suggested by Crocker and Algina (1986). After the survey was constructed, another statistics teacher, also considered an expert in the area for the population of interest, examined the survey for further review and provided additional feedback. After this review, modifications were made and the final items for the survey were constructed. The aforementioned process served to address the validity of the survey.

After the data was collected, Cronbach alpha estimates were generated for the total survey items, as well as for the items for each subscale. An overall $\alpha = .882$ (n=181) was observed for the 13 items. Cronbach alpha estimates for questions 1-5, which measures the teachers' attitudes about statistics, was .769 (n=185). Questions 6-8 measures

teacher attitudes about their training (α = .763, n=185) while questions 9-13 measures the teachers' perceptions about their students' attitudes about statistics (α = .793, n=183).

Descriptive and Inferential Statistics

The statistics from this study are presented in Table 1 in the Appendix, where the mode, mean, standard deviation, and median are grouped by the following grade levels: P-K, 1-5, 6-8, and 9-12. Also presented there are the inferential results for the comparison of means across the grade levels. Because there were similar attitudes across the grade levels when considering the mode, this statistic is reported and interpreted for all teachers (n = 186) below. Using a Likert scale of 1 = strongly disagree, 3 = undecided, and 5 = strongly agree, the following results were obtained:

Modal Responses

- Most of the teachers agreed that they like teaching statistics and that they are comfortable teaching statistics (mode = 4). Most also disagreed that statistics has no value and that it is not a useful subjects for students to learn (mode = 2). However, most of the teachers agreed that they do have difficulty understanding statistics concepts (mode = 4).
- Most teachers agreed that they have been properly trained to teach statistics (mode = 4) but they also agreed that they need additional training (mode = 4). Most disagreed that they were not adequately trained to teach statistics (mode = 2).
- Overall, most teachers were undecided about whether their students like statistics, enjoy learning statistics, understand statistics, and if their students will be able to master statistics problems on a standardized test (mode =3). On the other hand, most teachers disagreed that students in their classrooms do not see how statistics is used in real life (mode = 2).

Mean Responses

Although the mode provides some useful information for the most typical response, it does not alone adequately represent teacher attitudes. If the average response is considered, then many of the teachers were undecided on many of the questions, with most of the standard deviations as large as a one-category increase in attitude. This indicates that that even though most of the teachers had positive attitudes, some or enough of the teachers had less positive attitudes as well. There were also differences in teacher attitudes across the grade levels. To investigate these differences for each question, a one-way ANOVA and the Tukey

post hoc test, when appropriate, was considered. The following results revealed that:

- Although teachers generally disagreed that they see no value in teaching statistics, there were differences in teacher attitudes across grades levels ($F(3, 179) = 4.196$, $p = .007$; $\eta^2 = .07$). Grades 6-8 teachers disagreed that they see no value in teaching statistics significantly more than P-K teachers ($p = .018$) and marginally more than 1-5 teachers ($p = .058$). There were no attitude differences between grades 6-8 and 9-12 teachers.
- The mean range of teacher responses on their comfort level of teaching statistics was from slightly disagree to slightly agree (2.8 - 3.6). As a result, there were differences in teachers across grade levels when asked if they were comfortable teaching statistics ($F(3, 181) = 3.191$, $p = .025$; $\eta^2 = .05$). Teachers teaching in grades 6-8 reported being more comfortable teaching statistics than P-K teachers ($p = .033$), and slightly more comfortable (but not significantly) than grades 1-5 and 9-12 teachers.

Relationships

Previous research studies have considered teachers' responses to relationships between variables important to teaching and learning (Onwuegbuzie, 1998). Therefore, another point of interest was to describe how teachers responded to pairs of items that relate their attitudes about statistics, their perceptions related to student attitudes and achievement, and their attitudes about their preparation and training. The results indicate that:

- Teachers who agreed that they like teaching statistics also had a tendency to agree that they are comfortable teaching statistics ($r = .62$, $p<.0001$). Also, teachers who agreed that they like teaching statistics were more likely to disagree that they see no value in teaching statistics ($r = -.44$, $p<.0001$), that they have a hard time understanding statistics concepts ($r = -.42$, $p<.0001$), and that statistics is not a useful subject for students to learn ($r = -.37$, $p<.0001$).
- Teachers who disagreed that they have been properly trained to teach statistics also had a tendency to agree that they may need additional training in statistics ($r = -.48$, $p<.0001$).
- Teachers who disagreed that their students do not see how statistics can be used in real life were more likely to disagree that their students do not like statistics ($r = .29$, $p<.0001$). These

teachers also were more likely to agree that students in their classroom enjoy learning statistics ($r = -.38$, $p<.0001$) and that students in their classroom seem to understand statistics ($r = -.44$, $p<.0001$).

Follow-Up Survey

A few weeks later, a mandatory in-service workshop sponsored by The University of Alabama In-Service Center and a local school district was held for most of the same teachers who responded to the first survey. The director randomly selected teachers who responded to the first survey, for the follow-up survey at the end of their workshop (the nature of this workshop was not related to statistics). Using open-ended written questions, 40 teachers provided a more detailed description of their experiences teaching statistics. The teachers were asked specific questions about the statistics topics they were least comfortable teaching, questions regarding their statistics workshops/seminar experiences, and their experiences implementing the Data Analysis and Probability Standard in their classrooms. In addition, because positive results were obtained for those teachers who reported taking statistics courses, an effort was also made to inquire about the nature of these courses. Of the 40 teachers, there were $n = 2, 5, 9$, and 25 teachers represented for the P-K, 1-5, 6-8, and 9-12 grade levels, respectively.

When asked about which topics teachers were least comfortable teaching, a variety of the responses included:

- Bell curve
- Chi-square
- Standard deviations
- Probabilities
- Word problems
- Hypothesis testing
- Word problems with multi-steps
- Correlation
- Error analysis

The teachers were also asked to talk about how effective they were in implementing the data analysis standard in their classrooms. The standard states that students should be able to:

- Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them.
- Select and use appropriate statistical methods to analyze data.
- Develop and evaluate inferences and predictions that are based on data.
- Understand and apply basic concepts of probability.

Most of the teachers (about 70%) reported that developing and evaluating inferences and predictions that are based on data was the most difficult to implement. Some responded (25.3%) that obtaining real world data and applications is difficult and often takes too much class time. One 9-12 teacher reported that the standards require higher-level thinking and processing and that many of the students are not trained to think in this manner. Another grade 9-12 teacher reported that many students lack the appropriate reading comprehension skills needed to understand the components of the standards. Still, a grade 6-8 teacher reported that it presents a challenge to teach students to focus on concepts as opposed to concentrating on calculating the statistics (i.e., finding the 'right' number).

The teachers were also asked about their training to teach statistics. Many of the elementary and middle school teachers (75%) indicated that their college-level statistics course was helpful to them as a classroom teacher but it was "too technical" (P-K teacher) or "too extreme for middle school students" (6-8 teacher). One of the teachers reported that taking the course allowed him/her to understand "other topics I was not familiar with" and "it gave me a better understanding of other math courses".

Most of the high school teachers (87%) reported that the course was indeed helpful. Some of the teachers reported that descriptive statistics and data analysis techniques were the bigger topics that they learned from their college-level statistics course. A few teachers (15%) did report that their course was not helpful. One teacher commented that "the professor did not have a good grasp of the subject" while another teacher felt that "the course focused too much on concepts and content versus how to teach the concepts". Related to how to teach statistics concepts, in-service workshops are often used to train and/or help teachers with the teaching of statistics. All of the teachers reported that these workshops are invaluable to their teaching, indicating that "they provide overviews of topics", "they are better tailored to our needs", and "they help in class presentations".

Finally, the following three responses summarize all of the teacher's concerns about how to improve their teaching of statistics:

- We need more real-life, hands-on activities to use in the classroom.
- More workshops.
- More workshops sponsored by the districts and local universities.

Discussion and Implications

The primary purpose of this paper was to determine how teachers in the state of Alabama are progressing toward teaching statistics in

elementary and secondary education, by considering their attitudes and perceptions related to teaching and learning as well as their preparation and training. The results from a survey and a follow-up open-ended questionnaire are mixed, although some findings are consistent with previous research.

The findings that most of the teachers have overall positive attitudes toward statistics, as implied by the attitude response that occurred the most, did not necessarily support previous findings. In addition, the association between important pairs of variables also provided relationships which were positive, but did support previous research (i.e., teachers who reported that they like statistics also reported being comfortable teaching statistics). It is not clear as to why most teachers in this sample were more positive about their teaching and learning experiences; however, this finding is quite optimistic. It is possible that efforts from the statistics reform movement, which began over a decade ago and has its primary focus on improving the teaching and learning of statistics, particularly at the introductory level, has impacted learning and attitudes. Also, many of the topics taught in the introductory course are also taught at the middle and high school level, which offers teachers more use and application of statistics concepts. This might explain why most of the teachers reported that they like teaching statistics and are comfortable doing so – they have had more experience with statistics. Thus, although there is no direct evidence to support our ideas about why most of the teacher attitudes were positive, a shift in teaching philosophy dictated by reform (i.e., a focus on concepts and active learning), support from educators, administrators, and professional organizations (i.e., ASA, College Board), and an introduction to statistics concepts and courses offered in the lower grades could be contributing to our results. We are more inclined to consider that these factors have indeed helped contribute to more positive statistics experience for our teachers.

Even though most of the teachers in our sample have positive attitudes, there were teachers who also reported less positive attitudes – the mean attitude response was closer to undecided for many of the questions. There were also differences in the average teacher attitudes among the teachers for various grade levels considered. The findings revealed that P-K and 1-5 teachers had less positive attitudes regarding their comfort level in teaching statistics and the value they see in teaching statistics. Begg and Edwards (1999) also found similar results in their study of elementary and pre-service teachers' attitudes about statistics. Although not different statistically than the other grade levels, teachers in P-K and 1-5 grade levels also have less positive attitudes on *all* of the other items as well. A related result from the follow-up survey for P-K and 1-5 teachers revealed that they felt they did not use most of the

material they learned in their college-level statistics course in their classrooms -- which may explain their less positive attitudes. On the other hand, teachers teaching grades 6-8 and 9-12 had more positive attitudes about their teaching and learning experiences. As a result, the discrepancy of these findings for various grade levels might be related to how much the teachers interact with statistics concepts and ideas in their classroom. These conclusions also lend some support to the discussion of the next finding. There is statistical evidence from this study to indicate that how much statistics experience a teacher has had probably affects their attitudes and perceptions. In our study, eighty percent of the teachers have had at least one formal college-level statistics course. Onwuegbuzie (1998) found that teachers who had less exposure to courses in statistics had less positive attitudes; approximately 63 percent of teachers in that study had never taken a college-level statistics course. Both findings are supportive of a couple of theories about the teaching of introductory statistics. First, the successful teaching of introductory-level statistics courses at the college level can make a difference on teachers responsible for teaching concepts and courses in the lower grade levels. Second, because research has shown that exposure to statistics concepts is significant, then introducing students to many of these concepts in elementary and secondary education simply makes sense – and plays an important factor in further advancing the teaching and learning of statistics at all levels of education in the future.

Despite some positive findings however, the most important implication for educators is that teachers in this study also reported that they need additional training and that they have difficulties understanding statistics concepts, a sentiment with which many experienced postsecondary teachers could agree. The finding that teachers who disagreed that they have been properly trained to teach statistics also had a tendency to agree that they may need additional training is enlightening. Teachers appear to benefit from taking a college-level statistics course; however, one established way in which statistics educators can address other teachers' needs is through professional development activities and workshops. The teachers in this study specifically requested additional workshops by local universities and school districts to supplement their training. Recent research in mathematics education suggests that professional development activities that focus on specific content and pedagogy are effective strategies that improve teacher and student learning (Ball,1991; Battista, 1999; Hill & Ball, 2004). Consequently, because statistics is taught and treated as a separate discipline now in all levels of education, workshops devoted particularly to statistics learning would seem appropriate. At The University of Alabama In-Service Center,

university faculty and staff and local and state administrators work together to sponsor pre- and in-service workshops customized to teacher needs. This center conducts needs assessments every two years but there has yet to be a workshop devoted exclusively to statistics concepts. However, these kinds of workshops are taking place in other states around the country and many are sponsored by the College Board for AP teachers (see http://apcentral.collegeboard.com/teachers/0,,153-0-0-34486,00.html). Offering workshops such as these for non AP statistics teachers in Alabama who teach statistics concepts might be an excellent way for statistics educators in higher education to support P-12 teachers. Another longer-term goal might be to consider offering a statistics college course designed specifically with elementary, secondary, and AP statistics teachers in mind. If we want to continue to advance this movement, we as teachers of statistics in higher education need to collaborate often with our elementary and secondary teachers and administrators. We should share our knowledge, ideas, and research -- prepare our colleagues for many of the experiences we have already encountered.

In conclusion, although we found some interesting results about teachers' statistics experiences, the lack of a completely random sample and smaller sample sizes present an apparent limitation to the study. We do not attempt to generalize to a larger population but we feel that data collected on almost 200 teachers from around the state for the purpose of identifying the needs of our teachers is useful and provides important information for our sample at hand. In addition, we were not successful in learning more about teachers' perceptions of their students' attitudes and performance in statistics. Teachers were generally undecided about whether their students like statistics, enjoy learning statistics, understand statistics, and if they can master statistics problems on a standardized tests. Interestingly, teachers' perceptions of their students' learning and attitudes in this study mirrored their own (average) attitudes; a finding that is also validated in the literature (Hart, 2002; Quinn, 1997; Richardson, 1996; Thompson, 1992). Also, the teachers who participated in this study were involved in mandatory workshops and also worked with their chair persons in regards to contributing to this study. It is always possible that the teachers might have expressed positive attitudes due to this factor alone, which might have affected our results.

Finally, the primary focus and empirical research in statistics education has been at the undergraduate and graduate level, yet additional study and empirical research in the lower grades (i.e., related to teaching, learning, attitudes, assessment, and use of technology) will also be needed to evaluate and monitor teaching and learning at this level. Professional development activities, including continuing education workshops and seminars for P-12 teachers will be an important key to advancing the

current reform efforts. We need to continue to support our teachers and administrators. It should certainly help us toward the goal of statistical literacy for our students. After all, the key to improving statistics learning and attitudes in our classrooms probably begins in the classroom of your local school districts.

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Appendix

Table 1 Descriptive Statistics of Teacher Attitudes and Perceptions

1 = Strongly Disagree, 3 = Undecided, 5 = Strongly Agree

Item	Mode	Mean (standard deviation)	Median
1-I like teaching statistics.			
P-K	3.0	3.1(1.3)	3.0
1-5	4.0	3.2(1.2)	3.0
6-8	4.0	3.5(1.0)	4.0
9-12	4.0	3.3(1.0)	4.0
Total	4.0	3.3(1.1)	4.0
2-I see no value in teaching statistics in my classroom.			
P-K	2.0	2.8_a(1.0)	2.5
1-5	2.0	2.5(1.3)	2.0
6-8	2.0	2.0_b(0.8)	2.0
9-12	2.0	2.2(1.0)	2.0
Total	2.0	2.2(1.0)	2.0
3-I am comfortable teaching statistics in my classroom.			
P-K	2.0	2.8_a(0.9)	3.0
1-5	3.0	3.2(1.0)	3.0
6-8	4.0	3.6_b(1.0)	4.0
9-12	4.0	3.4(0.9)	4.0
Total	4.0	3.4(1.0)	4.0
4-Sometimes, I have a hard time understanding statistics concepts.			
P-K	2.0	3.1(1.2)	3.5
1-5	4.0	3.0(1.2)	3.0
6-8	2.0	2.5(1.1)	2.0
9-12	4.0	2.8(1.1)	3.0
Total	4.0	2.8(1.1)	3.0
5-Statistics is not a very useful subject for students to learn.			
P-K	2.0	2.5(1.1)	2.0
1-5	2.0	2.3(0.9)	2.0
6-8	2.0	2.0(0.9)	2.0
9-12	2.0	2.2(1.0)	2.0
Total	2.0	2.2(1.0)	2.0

6-I feel that I have been properly trained to teach statistics to the students in my classroom.			
P-K	3.0	2.7(1.1)	3.0
1-5	4.0	2.7(1.3)	3.0
6-8	4.0	3.1(1.2)	3.0
9-12	4.0	3.0(1.3)	3.0
Total	4.0	3.0(1.2)	3.0
7-My training in school did not prepare me to teach statistics.			
P-K	2.0	3.0(1.3)	3.0
1-5	2.0	3.0(1.4)	3.0
6-8	2.0	2.7(1.1)	3.0
9-12	2.0	2.9(1.2)	3.0
Total	2.0	2.9(1.2)	3.0
8-I feel that I may need more training in statistics.			
P-K	4.0	3.9(0.8)	4.0
1-5	4.0	3.3(1.1)	4.0
6-8	4.0	3.2(1.1)	4.0
9-12	4.0	3.5(1.0)	4.0
Total	4.0	3.4(1.1)	4.0
9- Students in my classroom do not like statistics.			
P-K	3.0	3.1(0.9)	3.0
1-5	3.0	2.8(0.6)	3.0
6-8	3.0	2.6(0.9)	3.0
9-12	3.0	3.0(0.9)	3.0
Total	3.0	2.8(0.8)	3.0
10-Students in my classroom enjoy learning statistics.			
P-K	3.0	3.0(0.7)	3.0
1-5	3.0	3.3(0.6)	3.0
6-8	3.0	3.3(0.8)	3.0
9-12	3.0	3.2(0.8)	3.0
Total	3.0	3.2(0.8)	3.0
11-Students in my classroom seem to understand statistics.			

P-K	3.0	2.9(0.8)	3.0
1-5	3.0	3.2(0.8)	3.0
6-8	3.0	3.3(0.9)	3.0
9-12	3.0	3.1(0.8)	3.0
Total	3.0	3.2(0.8)	3.0
12-Students in my classroom do not see how statistics can be used in real life.			
P-K	2.0	3.3(1.0)	3.0
1-5	2.0	3.0(1.0)	3.0
6-8	2.0	2.6(1.0)	3.0
9-12	3.0	2.8(0.9)	3.0
Total	2.0	2.8(1.0)	3.0
13-I believe that most of my students will master statistics problems on a standardized test.			
P-K	3.0	2.9(1.0)	3.0
1-5	3.0	3.0(0.8)	3.0
6-8	3.0	3.0(1.0)	3.0
9-12	4.0	3.1(1.0)	3.0
Total	3.0	3.0(1.0)	3.0

Note. 1 = Strongly Disagree, 3 = Undecided, 5 = Strongly Agree. Means that do not share subscripts for each question differ at $p < .05$ using the Tukey honestly significant difference comparison (the familywise error rate was considered). Relevant assumptions were evaluated for all analyses.
n = 14, 30, 69, and 73 for PK-K, 1-5, 6-8, and 9-12 respectively.

The Supervisory Role of the National Universities Commission and the Management of Universities in the South-South Zone of Nigeria

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